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Australian Financial Graphs: An Empirical Study

The use of graphs to disclose financial information in corporate annual reports represents a significant dimension of financial disclosure management. This study replicates and extends previous research into financial graphs by documenting the nature and extent of graph use and departures from representational neutrality among the 1991 corporate annual reports of the top one hundred companies listed on the Australian Stock Exchange. Eighty-nine per cent of companies use graphs; the mean number is 9.4, with diversified companies using the most graphs. The most commonly graphed financial variables are sales, profit, EPS and DPS. Evidence is found that graph use is contingent upon favourable performance. In addition, material measurement distortion is found in 34 per cent of all key financial graphs. Eighty-six per cent of companies have slope parameters which depart more than 10° from the optimum, thus impairing communicative effectiveness. A range of design strategies are employed which are consistent with the adoption of an impression management schema. No persistent systematic differences between forms of distortion and industry group are found. Comparison with prior single-country studies reveals that graphs are used more extensively in Australia than in the U.S.A., the U.K. or Canada, but that there is less evidence of impression management. This latter finding is consistent with the view that there are fewer short-term and capital-market pressures in Australia.

Keywords: Communication; Corporate annual reports; Disclosure; Graphs.

The use of graphs by management represents part of the 'impression management' process. Neu (1991) and Neu and Wright (1992) demonstrate how the Canadian accounting profession used impression management techniques to convince uninformed users that accountants are trusted and legitimate. Professional practices were used to attempt to create a schema of the trustworthy auditor. In the same way, management use impression management, including financial graphs, to create the schema of trustworthy management. Financial graphs display select information

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and present information in set ways to legitimize to the user of the annual report the management's right to run the company.

Impression management using financial graphs occurs in three principal ways. First, management can decide, on an annual basis, whether or not to use graphs at all and, if used, which specific variables to graph. Second, graphical construction techniques can be used to manipulate the message conveyed (e.g., non-zero axes or altering a graph's shape). Finally, graph design features can be used to enhance the message conveyed by the accounting numbers in an unwarranted way (e.g., by unduly emphasizing the colour of the last specifier [column] in a sequence).

Impression management satisfies the need for external legitimacy and allows management to maintain its control over the company. As part of this legitimization process, management attempts to convince shareholders that the company is being run competently and efficiently. As part of this social legitimization, it thus becomes important to enhance corporate achievements. Consequently, a company's managers have incentives to represent their company's performance in the best possible light, potentially resulting in selective financial representation (Tweedie and Whittington, 1990; Revsine, 1991).

Financial graphs, therefore, represent an important area of accounting research. Studies have been conducted in the U.S.A. (Johnson *et al.*, 1980; Steinbart, 1989), in the U.K. (Beattie and Jones, 1992a, 1992b), in the U.K. and U.S.A. (Beattie and Jones, 1997), in Ireland (Green *et al.*, 1992) and in Canada (CICA, 1993). Graphs are used widely, presented prominently, and frequently provide distorted measurement impressions. However, until a recent study by Mather *et al.* (1996), the use of financial graphs in an Australian context has been neglected. This is surprising, since Australia is recognized to be an important country in terms of accounting.¹ Australia is also likely to prove an interesting country to study since its accounting environment is currently in flux—moving from a U.K. to a U.S. sphere of influence (Parker, 1994a). Finally, the prevalence of a large number of extractive companies, with unique accounting practices (Luther, 1993), differentiates Australian financial reporting from that in the U.S.A., U.K., Ireland and Canada.

The possibility that management will use graphical disclosures for impression management is enhanced by their unaudited nature. The relevant Australian auditing statement (AUS 212, 1995) maintains that while the auditor has no specific responsibility to determine that other information is properly stated, the auditor should read the other information to determine whether or not material misstatements or material inconsistencies exist. Where material misstatements exist, the actions taken by the auditor are contingent upon the particular circumstances. Without explicit national or international guidance, however, the judgments by auditors of the terms 'material', 'inconsistency' and 'misstatement' are necessarily subjective and potentially arbitrary.

¹ For example, Australia was a founding member of the International Accounting Standards Committee, has a comparatively large and old accountancy profession, and influences accounting developments in the West Pacific Rim (Parker, 1994b, pp. 15–17). Its theorists have been prominent in accounting debates for decades—especially in the 1960s and 1970s with Ray Chambers, Russell Matthews, Ken Wright, Ray Ball and Phil Brown to the fore.

In evaluating good graphical practices, the issues of (a) selectivity, (b) measurement distortion, (c) orientation distortion, and (d) presentational enhancement need to be considered.² Selectivity occurs when graphs are chosen judiciously in order to give a desired effect, for example, graphs of key variables might only be used when management reports favourable financial performance. Measurement distortion is defined here to occur when the physical representation of the numbers on the graph is not directly proportionate to the numerical values being portrayed (Tufte, 1983, p. 56). Orientation distortion occurs when the slope parameter diverges from 45°, the optimum for communicative effectiveness (Cleveland *et al.*, 1988, p. 293). Finally, presentational enhancement occurs when judicious presentational techniques generate a more flattering view of the results than is warranted by the underlying data (e.g., use of arrowheads at the top of columns; Beattie and Jones, 1992b). Both measurement distortion and orientation distortion have been shown empirically to impair the accuracy with which graphs are decoded; the impact of presentational issues, however, is largely unexplored.

The purpose of this study is to extend understanding of graphical reporting practices in the Australian accounting environment. There are four main objectives. The first is to establish the nature of graph use in the annual reports of Australian companies and, in particular, to describe the type of graphs used, the topics graphed, the location of the graphs, and the length of time series reported. The second objective is to document and analyse cases where the principle of representational neutrality has been violated, as regards selectivity, measurement distortion, orientation distortion, and presentational aspects of graph use. By doing this, we hope to draw the attention of both users and regulators to possible impression management using financial graphics. The third objective, given research evidence of the persistent influence of industry group on reporting practices and choices, is to investigate whether graphical reporting practices vary between the industrial and service, extractive, financial services, and diversified sectors. The final objective is to compare and contrast the results of this Australian study with prior single-country studies conducted in the U.S.A., the U.K., Canada and Australia.

LITERATURE REVIEW

Financial Reporting Incentives

The financial disclosure literature emphasizes the incentives that management have for 'selective financial representation' (Revsine, 1991, p. 17). This literature, much of which is premised upon positive accounting theory (see Watts and Zimmerman, 1986; 1990), focused initially on managerial manipulation of the basic accounting numbers (see, e.g., Schipper's, 1989, review of earnings management). In the U.K., for example, the use of creative accounting whereby management manipulates

² These four forms of distortion are generally independent. They may result from ignorance of fundamental graphical construction and design issues or from an intentional desire by the preparers of the graphs to manage the impressions of users.

accounting numbers to give a better impression of performance than is warranted has been widely chronicled (e.g., Griffiths, 1986; Tweedie and Whittington 1990; Phillips and Drew, 1991; Smith, 1992; Schilit, 1993; Cahill, 1997; and Clarke *et al.*, 1997).

More recently, however, attention has shifted away from accounting numbers to a broader definition of disclosure. Disclosure management includes attempts to manage the *interpretation* of data (perhaps by burying sensitive data or highlighting good news; Gibbins *et al.*, 1990). Impression management has been detected in the formats in which the accounting numbers are presented. The presentational format of accounting information has been shown by Thomas (1991, pp. 45–6) to have a demonstrable impact upon human perceptions and judgments of performance. Accounting narratives and photographs are two areas where manipulation of the presentational format has been found. In accounting narratives, management is systematically found to enhance positive, but to downplay negative news. For example, in a study of environmental disclosures in annual reports, Deegan and Gordon (1996) demonstrate that impression management occurs. Good news is reported and emphasized, while bad news is omitted or, if included, de-emphasized. Research into the design of annual reports, particularly in respect to photographs, has demonstrated that photographs and design are used to present the corporate image in as favourable a light as possible. McKinstry (1996), for example, studied the annual reports of Burton Plc from 1930 to 1994. He concludes that '[e]very conceivable design device has been used by the company and its design contractors to portray it and its top management in the best possible light, and to influence the perception of the City and the individual investor' (1996, p. 107). From a U.S. perspective, Graves *et al.* (1996) and Preston *et al.* (1996) both confirm the growing tendency for visual imagery to be used in annual reports. Graves *et al.* (p. 83) suggest 'that the pictures and artwork of annual reports serve the rhetorical purpose of arguing the truth claims of these reports and the social constructs they represent'.

Interpretative shading (framing effects) has been shown to be very influential in altering the meaning attributed by data users in the accounting context (Hofstede, 1972). The use of graphs to disclose financial information in corporate annual reports represents a significant dimension of financial disclosure management (Gibbins *et al.*, 1990, p. 129; 1992, p. 22; Preston *et al.*, 1996, p. 115). In particular, graphs, being unconstrained by statutory regulation, allow preparers to judiciously select and manipulate the financial message conveyed.

Principles of Graph Design and Construction

A detailed review of the literature on the theory of graphical perception and visual processing is beyond the scope of this paper (interested readers are referred to Schmid 1983; Tufte, 1983; Cleveland and McGill, 1987; and Kosslyn 1989, 1994). Although many of the principles of graph design and construction were originally *ad hoc*, normative statements, subsequent empirical research by statistical graphics researchers has confirmed many of them. Certain principles of graphical design and construction are outlined briefly below in order to contextualize our study.

Readers of graphs initially scan the graph rapidly, detect geometric patterns, and typically then make inferences about the data. Initial perceptual tasks may (but also may not) be followed by more cognitive tasks such as the estimation of trends. The fundamental principle upon which all graphs are based is that the physical measures on the surface of the graph are directly proportionate to the numerical values being represented (Tufte, 1983, p. 56). Departures from this principle are termed 'measurement distortion' (Beattie and Jones, 1992b, p. 293).

Another important feature of a graph's design, if it is to communicate effectively, is the angle of the graph's trend-line, termed the *slope parameter* (Cleveland and McGill, 1987; Hollands and Spence, 1992). Recent studies in statistical graphics show that judgmental accuracy is optimized when the slope parameter is 45° (Cleveland and McGill, 1987) since graph readers are best able to distinguish data variation at this slope parameter. Moreover, as higher slope parameters are generally *perceived* as showing greater data change, slope parameters can be manipulated to invite the reader to draw inferences which are not explicitly present (Simcox, 1984). 'Orientation distortion', which is distinctly different from measurement distortion, occurs where the slope parameter diverges from 45°, resulting in inaccurate and biased judgments (Cleveland *et al.*, 1988, p. 293).

Graphs comprise four standard components: background, framework, specifier, and labels (Kosslyn, 1989).³ Kosslyn argues that for efficient graph decoding each element should be present and be located in the conventional position. Design strategies can also enhance or obscure the underlying data. We refer to departures of this type as 'presentational enhancement'. Their impact is, however, largely unexplored in the statistical graphics literature.

Measurement distortion, orientation distortion and presentational enhancement may each result in biased or ineffective communication of financial information. In addition, selectivity, which occurs where graphs are used judiciously to give a desired impression, may cause only a partial view to be given of corporate financial performance.

Financial Graphics

In this section, we review the findings of published prior single-country and bilateral studies: two U.S. (Johnson *et al.*, 1980; Steinbart, 1989), one U.K. (Beattie and Jones, 1992a, 1992b), one Irish (Green *et al.*, 1992), one Canadian (CICA, 1993), one Australian (Mather *et al.*, 1996) and one bilateral U.K.–U.S.A. study (Beattie and Jones, 1997).

Johnson *et al.* (1980) randomly select fifty U.S. corporate annual reports from the Fortune 500 in 1977 and 1978. This study is small and covers neither selectivity, measurement distortion, orientation distortion, nor presentational enhancement. The main finding is that 30 per cent of the graphs studied were constructed improperly. Steinbart (1989) conducts a more extensive study, based on 319 U.S. annual reports for 1986, selected from the Fortune 500. A particular feature of Steinbart's study is the focus on selectivity and measurement distortion (neither orientation

³ For a more detailed discussion, see Beattie and Jones (1992a, ch. 2).

distortion nor presentational enhancement are covered). In his study, companies were more likely to include graphs of key variables (sales, income and dividends) when income had increased, rather than declined. In addition, using Tufte's (1983) graph discrepancy index (GDI), Steinbart ascertains that 26 per cent of all graphs overstate time trends by more than 10 per cent (with the majority of distortions being in the company's favour).

Beattie and Jones' (1992a, 1992b) study of 240 U.K. listed companies' corporate annual reports for 1989 is the most detailed to date, although orientation distortion is not considered. Seventy-nine per cent of companies used graphs, with four key financial variables (KFVs)—sales, profit before tax, earnings per share (EPS), and dividends per share (DPS)—together with segmental information, constituting 60 per cent of all graphs. Financial companies are found to be significantly less likely to include KfV graphs, although the impact of industrial group is not explored further. Beattie and Jones find that KfV graphs are significantly more likely to be included in the annual reports of companies with 'good', rather than 'bad', performance. Performance is classified as good or bad on the basis of the directional change in both EPS (a general performance indicator) and the specific financial variable being tested. Thirty per cent of KfV graphs exhibited material measurement distortion, with KfV time trends being three times more likely to be materially exaggerated than materially understated. Finally, Beattie and Jones identify and document frequent instances of devices that enhanced the presentation of graphs. Green *et al.*'s (1992) study on 117 Irish semi-state sector and public limited companies replicates Beattie and Jones' (1992b) study, and also finds evidence of selectivity and material measurement distortion. The Irish study, however, detects no systematic, favourable measurement bias.

In 1993, the Canadian Institute of Chartered Accountants (CICA) surveyed 200 Canadian 1991 annual reports. The report is primarily descriptive, with no systematic analysis of selectivity, measurement distortion, orientation distortion or presentational enhancement. The report's main finding is that 83 per cent of companies use graphs, with the four most popular graph topics being sales or revenue (90 per cent of companies); earnings, income or profit (89 per cent); shareholders' equity (62 per cent); and assets (62 per cent).

Mather *et al.* (1996) replicate Beattie and Jones' (1992a, 1992b) methodology on Australian companies, confirming extensive graph usage.⁴ However, they find mixed results when they replicate Beattie and Jones' two hypotheses on selectivity and distortion. First, on selectivity, they find no significant relationships between the inclusion of graphs and company performance, in terms of either their whole sample or for the top fifty companies. 'These findings contrast sharply with those of Steinbart and of Beattie and Jones' (p. 59). For the next hundred ranked companies,

⁴ The present Australian study can be distinguished from Mather *et al.*'s 1996 study in two main ways. First, by its wider scope and coverage of issues, such as presentational enhancement, orientation distortion, length of time series graphed, graph type and topic analysis, and, second, by its findings on selectivity which serve to contextualize the Mather *et al.* study. The present authors were unaware of the existence of the prior Australian study until February 1997, immediately prior to submission of this paper to a refereed journal.

however, they do find some significant relationships for five out of nine tests. Second, on distortion, they find that 'distorted graphs of any of the key financial variables are significantly more likely to present performance favourably than unfavourably' (p. 61). This is consistent with previous U.S. and U.K. findings.

Although providing welcome new evidence, Mather *et al.*'s (1996) study does not address some important aspects of graph usage such as topics graphed, graph types used, location of graphs, use of graphic designer, length of time series graphed, effect of industrial classification on graph usage, presentational enhancement and orientation distortion. In addition, their findings on selectivity are at variance with prior studies and require further investigation. In particular, unlike Beattie and Jones (1992a, 1992b), they neither use EPS as the directional performance indicator nor measure performance over five years.

In a bilateral study, Beattie and Jones (1997) compare the graphical reporting practices of 176 leading U.S. and U.K. companies. Ninety-two per cent of U.K. companies compared to 80 per cent of U.S. companies used graphs. In both countries, selectivity in graph usage was found. In the U.K., selectivity was found over both five years and one year. However, in the U.S. selectivity was found more over five years than over one year. In both countries, evidence of measurement distortion and presentational enhancement was discovered.

Hypotheses

From this review of the extant statistical and accounting graphics literatures, we develop the following six hypotheses (stated in alternative form).

- H1: Graphs of at least one KfV are more likely to be included in the annual reports of companies with 'favourable' rather than 'unfavourable' performance, where performance is measured in terms of a general performance indicator.
- H2: Graphs of specific individual KfVs are more likely to be included in the annual reports of companies with 'favourable' rather than 'unfavourable' performance, where performance is measured in terms of the specific KfV graphed.
- H3: Measurement distortion is likely to give a more, rather than a less, favourable portrayal of the company's performance.
- H4: Favourable measurement distortion is more likely to occur in the annual reports of companies with 'unfavourable' rather than 'favourable' performance, where performance is measured in terms of the variable graphed.
- H5: Departures from the optimal slope parameter (45°) are likely to convey a more, rather than a less, favourable perception of the company's performance (i.e., they will be greater, rather than less, than 45°).
- H6: Different broad industrial categories will exhibit distinctive patterns of graph usage.

METHODS

The top one hundred companies (by market capitalization as at 31 December, 1992) listed on the Australian Stock Exchange were selected (Australian Stock Exchange, 1992). Eighty-nine out of the hundred companies (listed in Appendix A) responded to our request for their 1991 corporate annual report. The sample companies were classified into four broad industrial categories: 41 industrial or service, 26 extractive, 19 financial services, and 3 diversified companies. We analysed the graphs in ninety-nine documents sent by these companies (ten companies sent two documents).⁵

Information was collected about the use, design and construction of graphs, together with data relating to the companies' financial performance. Where more than one variable was shown on a single graph, we recorded the appropriate fraction under each topic variable. A graph discrepancy index (GDI), based on Tufte's (1983) lie factor, was used to calculate measurement distortion, following the methodology established by Beattie and Jones (1992a, 1992b). The GDI is defined as follows:

$$\text{GDI} = [(a/b) - 1] * 100\%,$$

where a = percentage change (in cm) depicted in the graph, and
 b = percentage change in the data.

This index is zero in the absence of measurement distortion, positive if the graph exaggerates the data trend, and negative if the graph understates the trend. Exaggerations of upward trends and understatements of downward trends are favourable to the company, while understatements of upward trends and exaggerations of downward trends are unfavourable to the company. When analysing our results we distinguish between raw GDI (RAWGDI) and adjusted GDI (ADJGDI), the latter being GDI adjusted to take into account favourable and unfavourable trends. For example, if the raw GDI is positive and the performance trend is downward (i.e., unfavourable), then the sign of the GDI is reversed (i.e., adjusted GDI is negative). In addition, the slope parameter was measured using a protractor. The data were coded by a professionally qualified accountant, checked by one of the researchers, and input into a statistical package for subsequent analysis.

RESULTS

Incidence of Graph Use

The incidence of graph use is shown in Table 1. The vast majority of Australian companies (89 per cent) graphed at least one performance or non-performance

⁵ In these ten cases, companies typically sent documents entitled 'Annual Report', which dealt with the statutory accounts, and 'Annual Review', which provided a narrative, qualitative report of annual activities. Graphs were only contained in the Annual Review, except for Broken Hill Proprietary Co., where graphs were found in both documents. Both documents were included in our study since both were sent to shareholders and given equal status by the company.

TABLE 1

INCIDENCE OF GRAPH USE IN THE ANNUAL REPORTS OF
LARGE LISTED AUSTRALIAN COMPANIES

Variable graphed	Companies (<i>n</i> = 89)	
	No.	%
Any variable	79	89
At least one key financial variable (KfV)	64	72
Specific key financial variables (KfVs)		
Sales	32	36
Profit	56	63
Earnings per share (EPS)	34	38
Dividends per share (DPS)	33	37
Mean number of graphs	No. of graphs	
For all companies (<i>n</i> = 89)	9.4	
For graph-using companies only (<i>n</i> = 79)	10.5	
For diversified companies (<i>n</i> = 3)	25.7	
For financial services companies (<i>n</i> = 19)	12.3	
For extractive companies (<i>n</i> = 26)	8.7	
For industrial and service companies (<i>n</i> = 41)	7.2	

variable. Seventy-two per cent of companies graphed at least one of the four generic KfVs identified by Beattie and Jones (1992a, 1992b): sales, profit, EPS and DPS. The most commonly graphed KfV was profit (63 per cent of companies). No standard profit measure was graphed, with many companies graphing several alternative definitions. Altogether, 79 profit variables were graphed by 56 companies in 66.83 graphs: 45 were variants of profit *after* tax (e.g., before or after extraordinary items); 31 were variants of profit *before* taxation (e.g., profit before tax and interest); and 3 were equity profit.⁶ EPS and DPS frequently were graphed either together or with other variables.

Generally, Australian companies highlighted their KfV graphs by positioning them, as a group (often with one or two other graphed variables), near the front of the annual report. The three variables most frequently highlighted with the KfVs were assets (various definitional forms), 19.16 graphs; return on capital employed (ROCE), 13 graphs; and shareholders' funds, 10.16 graphs. On average, the space allocated to the grouped graphs was 0.54 pages, with 61 per cent of groups occurring in the first five pages of the annual report.

⁶ In Beattie and Jones (1992a, 1992b) U.K. companies were found overwhelmingly to graph profit before tax (thus treated as the profit KfV). For Australian companies, the lack of a standard profit measure determined that a more general 'profit' definition (including before and after taxation) was treated as the KfV. Profit, EPS, sales and DPS were graphed by 56, 34, 32 and 33 companies in 66.83, 26.00, 30.50, and 26.50 graphs, respectively.

The overwhelming majority of graphs (76 per cent) were for five-year time trends. Fourteen per cent of the graphs portrayed *more* than five years, while 10 per cent portrayed *less* than five years. Interestingly, this distribution does not conform to the number of years of historical data presented. Of the forty-two companies which included historical summaries in their annual report, only 38 per cent presented five years data, with 36 per cent presenting ten years. Only 5 per cent of companies, however, graphed a ten-year trend.

Distribution of Graphs by Type

In total, the 89 companies used 833 graphs, which averages 9.4 graphs per company (rising to 10.5 when only the 79 companies using graphs are considered). As Table 2 shows, the most popular graph type was the column graph, which was particularly popular for the KFVs, especially sales and DPS (79 per cent). Bar graphs together with column graphs comprised 86 per cent of KFVs and 65 per cent of all graphs.⁷ For the non-KFVs, line and pie graphs were relatively more popular. In particular, pie graphs were used more frequently as a result of the non-time series nature of many of these non-KFVs. In such cases, where the display of proportions rather than trends is the main graphical purpose, pie graphs are more appropriate than either column graphs or line graphs (Spence and Lewandowsky, 1991).

Analysis of Graphs by Topic

Table 3 presents an analysis of all 833 graphs by topic. The four KFVs (sales, profit, EPS and DPS), together with segmental information relating to sales and profit, represent 28.2 per cent of these graphs. Segmental information relating to the business sector was more frequently graphed (69 graphs) than segmental information relating to geographical location (16 graphs). 'Secondary' segmental information totalled 12 graphs.⁸ Other commonly graphed variables (i.e., taken as more than fifteen graphs) were: assets (47.7 graphs), raw material prices (41 graphs), market indices (37.5 graphs), raw material products (30 graphs), asset portfolio analysis (24 graphs), shareholders' funds (18.2 graphs), financial gearing (18 graphs), ROCE (18 graphs), and share price (16.5 graphs). The high number of raw material prices and products graphs reflects the primary-industry nature of many of the Australian companies. The remainder of the topics graphed were very varied, with a further seventeen topics being shown in seven or more graphs.

Graphic Designers

In total, fifty-eight (65 per cent) of our sample acknowledged explicitly the use of a graphic design company. The market for corporate graphic designers appeared extremely fragmented. Ross Barr and Associates, together with Horniak and Canny, despite being the most popular designers in our sample, were each used by only four companies. Forty-two different designers were employed, with thirty-two being

⁷ Bar graphs are presented horizontally; column graphs vertically.

⁸ Secondary segmental graphs are those where individual business or geographical sectors have been further segmented.

TABLE 2
DISTRIBUTION OF ALL GRAPHS BY TYPE

Type of graph	Sales		Profit		EPS		DPS		Total KFVs		Non-KFVs		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Column	24.0	79	52.0	78	19.5	75	21.0	79	116.5	78	336.5	49	453.0	55
Bar	3.0	10	4.3	6	2.5	10	2.0	8	11.8	8	72.2	11	84.0	10
Line	3.5	11	8.5	13	4.0	15	3.5	13	19.5	13	158.8	23	178.3	21
Pie	—	—	—	—	—	—	—	—	—	—	102.0	15	102.0	12
Other	—	—	2.0	3	—	—	—	—	2.0	1	13.7	2	15.7	2
Total	30.5	100	66.8	100	26.0	100	26.5	100	149.8	100	683.2	100	833.0	100

AUSTRALIAN FINANCIAL GRAPHS

TABLE 3

ANALYSIS OF ALL GRAPHS BY TOPIC

Topic	No.	%																								
Key financial variables (KFVs)	149.8	18.0																								
Segmental information:																										
<table><tr><td></td><td>Business sector</td><td>Sales Geographical location</td><td>Business sector</td><td>Profit Geographical location</td><td>Total</td></tr><tr><td>Time series</td><td>29</td><td>3</td><td>10</td><td>1</td><td>43</td></tr><tr><td>Non-time series</td><td>17</td><td>8</td><td>13</td><td>4</td><td>42</td></tr><tr><td>Total</td><td>46</td><td>11</td><td>23</td><td>5</td><td>85</td></tr></table>				Business sector	Sales Geographical location	Business sector	Profit Geographical location	Total	Time series	29	3	10	1	43	Non-time series	17	8	13	4	42	Total	46	11	23	5	85
	Business sector	Sales Geographical location	Business sector	Profit Geographical location	Total																					
Time series	29	3	10	1	43																					
Non-time series	17	8	13	4	42																					
Total	46	11	23	5	85																					
	85.0	10.2																								
Secondary segmental analysis	12.0	1.5																								
Other variables (seven or more graphs)																										
Assets (various definitional forms)	47.7	5.7																								
Raw material prices	41.0	4.9																								
Market indices—stocks/shares	37.5	4.4																								
Raw material products	30.0	3.6																								
Asset portfolio analysis	24.0	2.9																								
Shareholders' funds	18.2	2.2																								
Financial gearing	18.0	2.2																								
Return on capital employed (ROCE: various definitional forms)	18.0	2.2																								
Share price	16.5	2.0																								
Dividends (various definitional forms)	14.5	1.7																								
Employees	13.0	1.6																								
Net asset value per share	12.0	1.4																								
Unit sales	12.0	1.4																								
Capital expenditure	10.5	1.3																								
Measure of market size	11.0	1.3																								
Funds under management	11.0	1.3																								
Total new dwellings	10.0	1.2																								
National economic statistics	10.0	1.2																								
Health and safety measures	9.0	1.1																								
Exchange rate	8.0	1.0																								
Cash flow	8.0	1.0																								
Employee performance (various definitional forms)	8.0	1.0																								
Exploration and development expenses	8.0	1.0																								
Net debt and borrowing	7.8	0.9																								
Bad debts	7.0	0.8																								
Work in hand	7.0	0.8																								
Other (less than seven graphs)	168.5	20.2																								
Total	833.0	100.0																								

used by only one company each. We investigated whether those companies using graphic designers would be more likely than those which did not, first, to use graphs and, second, to use KfV graphs. Using a chi-square test for independence (two-tailed), both these propositions were supported at the 5 per cent level ($p = .013$ and $p = .008$, respectively).

Selectivity in the Use of Graphs Displaying KfVs

H1 and H2, concerning whether KfV graphs are more likely to be included in the corporate annual reports of companies with 'favourable' rather than 'unfavourable' financial performance, were tested using a series of chi-square tests.⁹ The presence or absence of *at least one* of the four KfV graphs (i.e., one out of sales, profit, EPS or DPS), as well as the presence or absence of each individual KfV graph (sales, profit, EPS and DPS) were investigated. Favourable and unfavourable financial performance was measured as the directional change (i.e., increase or decrease) in sales, profit, EPS and DPS. This directional change was measured over both one year and five years.¹⁰

For H1, we used the directional change in three general performance indicators (sales, EPS and profit before tax), generating six tests. Thus, for example, we tested to see if the presence or absence of *at least one* of the four KfV graphs was associated with an increase or decrease in the sales trend over one year or five years. For H2, by contrast, we measured the directional change in the specific KfV against the presence or absence of that particular KfV, generating eight tests. Thus, for example, we investigated whether the presence or absence of an EPS graph was associated with an increase or decrease in the EPS trend over either one year or five years.

Only those results that were significant at the 10 per cent level or higher are reported in Table 4. Significant associations were found between the inclusion of *at least one* KfV graph and the five-year profit trend as well as the five-year sales trend at the 1 per cent and 10 per cent level, respectively (two out of six associations tested). In other words, we found that the presence of *at least one* KfV was more likely when the five-year profit trend and/or the five-year sales trend increased, rather than decreased. Turning to individual variables, only the presence of an EPS graph was associated with the trend in EPS (five years) (one out of eight associations tested). In this case, therefore, we found that the presence of an EPS graph was associated with an increase rather than a decrease in the five-year EPS trend. Statistical evidence is thus moderately supportive of both H1 and H2. In particular, the presence of *at least one* KfV is associated strongly with the five-year profit trend.

⁹ Following Siegel and Castellan (1988, p. 123), we used χ^2 corrected for continuity when $n > 40$. When n was between twenty and forty we used χ^2 . Where the smallest expected frequency was less than five, or $n < 20$, we used the Fisher Exact Test. We report only the significant results.

¹⁰ Historical trend data were obtained, in the first instance, from the five-year summary contained in the annual reports and, if none was included, from the graphs themselves which, generally, have specific values attached to the specifiers. In a few cases, neither source provided the data.

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TABLE 4

SIGNIFICANT TESTS OF THE RELATIONSHIP BETWEEN THE USE OF GRAPHS FOR
KEY FINANCIAL VARIABLES AND DIRECTIONAL PERFORMANCE INDICATORS

Presence of graph	Performance indicator	Chi-square test statistic (corrected for continuity)	Number of companies for which five-year trend was available	Level of significance (two-tailed)
At least one KfV	five-year profit trend	8.531	54	0.001***
At least one KfV	five-year sales trend	2.930	52	0.087*
EPS	five-year EPS trend	2.909	55	0.088*

* Significant at the 0.10 level. *** Significant at the 0.01 level.

Measurement Distortion

The GDI, described above, was used to calculate measurement distortions for each KfV graph in our sample.¹¹ Based on prior literature, we consider distortions greater than 5 per cent (in absolute terms) to be material. Tufte (1983, p. 57) describes distortions in excess of 5 per cent as 'substantial distortion, far beyond minor inaccuracies in plotting', while Pany and Wheeler's (1989) review identifies 5 per cent as the most appropriate materiality level.¹²

Of the 146 KfV graphs, where measurement was possible, we found fifty instances (34.2 per cent) of material distortions (thirty-one favourable and nineteen unfavourable: see Tables 5 and 6). Profit and DPS were more than twice as likely to be favourably rather than unfavourably presented. EPS was the only variable with a greater absolute number of unfavourable compared to favourable discrepancies (a counter-intuitive result). However, for this variable the magnitude of the favourable discrepancies is high compared to the magnitude of unfavourable discrepancies (66 per cent vs 18 per cent). Overall, the mean material favourable discrepancy was 30.2 per cent and the mean material unfavourable discrepancy was 21.6 per cent. Thus, 34 per cent of Australian KfVs exhibited material measurement distortion, and favourable, rather than unfavourable, distortions predominated in terms of both the absolute number of distortions and magnitude of distortion. However, whether these distortions (which can be attributable to either specific causes, such as a non-zero axis, or inaccurate draughtsmanship) were due to the exuberance and statistical naivety of designers or were a deliberate attempt to manage impression is unclear.¹³ Further research involving graphic designers will be necessary to clarify this issue.

¹¹ Where a company graphed the same key variable twice, the measurement distortion was calculated for the graph which occurred first in the annual report.

¹² There is, however, a need for experimental testing of this threshold in the context of financial graphs.

¹³ We are grateful to an anonymous referee for raising this point.

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TABLE 5

INCIDENCE OF MEASUREMENT DISTORTION IN KEY FINANCIAL VARIABLE GRAPHS

Adjusted Graph Discrepancy Index (Adjusted GDI)	Sales No.	Profit No.	EPS No.	DPS No.	Total No.	%
Material favourable discrepancy	6	13	4	8	31	21
Material unfavourable discrepancy	5	5	6	3	19	13
No material discrepancy	21	35	20	20	96	66
Total	32	53	30	31	146	100
Mean material favourable discrepancy (Adjusted GDI)	31.8	27.9	66.4	14.8		30.2
Mean material unfavourable discrepancy (Adjusted GDI)	20.0	27.7	17.7	21.9		21.6
Mean material exaggeration (Raw GDI)	+31.8	+32.4	+66.4	+13.0		+32.3
Mean material understatement (Raw GDI)	-20.0	-11.9	-17.7	-23.2		-18.2

TABLE 6

FREQUENCY DISTRIBUTION OF ADJUSTED GRAPH DISCREPANCY INDEX SCORES IN KEY FINANCIAL VARIABLE GRAPHS

Adjusted Graph Discrepancy Index (Adjusted GDI) %, classed as favourable (+) and unfavourable (-)				Sales No.	Profit No.	EPS No.	DPS No.	Total No.	%
	Adjusted GDI	≤	-50	—	1	—	1	2	1.4
-50	<	Adjusted GDI	≤ -25	2	1	2	—	5	3.4
-25	<	Adjusted GDI	≤ -10	1	1	3	—	5	3.4
-10	<	Adjusted GDI	≤ -5	2	2	1	2	7	4.8
-5	<	Adjusted GDI	≤ 0	9	20	12	11	52	35.6
0	<	Adjusted GDI	≤ 5	12	15	8	9	44	30.1
5	<	Adjusted GDI	≤ 10	1	4	—	4	9	6.2
10	<	Adjusted GDI	≤ 25	2	4	2	2	10	6.9
25	<	Adjusted GDI	≤ 50	2	4	—	2	8	5.4
50	<	Adjusted GDI	≤ 100	1	—	1	—	2	1.4
100	<	Adjusted GDI			1	1	—	2	1.4
Total				32	53	30	31	146	100.0
Mean adjusted GDI score									+3.5
Mean material adjusted GDI score (n = 50)									+10.5

The binomial test was used to test H3, that measurement distortion is likely to give a more, rather than a less, favourable portrayal of a company's performance. The number of material distortions for each KfV (i.e., sales, profit, EPS and DPS) and the total number of material distortions pooled across all four KfVs were tested (i.e., five tests). Both the profit material distortion ($p = .048$) and the total material distortions ($p = .060$) were found to be significant using a one-tailed test. H3 is thus partly supported. H4 (that favourable measurement distortion is more likely to occur in companies with unfavourable rather than favourable performance, where performance is measured in terms of the variable graphed) was not, however, supported when investigated using a series of chi-square tests over both one and five years (i.e., eight tests).

Slope Parameter

The 117 positive KfV graph slope parameters in the sample were widely dispersed, with only 14 per cent falling within 10° of 45° (the optimum). Thus, the individual slope parameters differed markedly from 45° , impeding the communicative effectiveness of Australian financial graphs. The overall mean positive slope was 31.2° , and individual KfV mean positive slopes were 36.2° for sales, 36.8° for profit, 24.3° for EPS, and 23.2° for DPS. H5 was tested using the binomial test, and there was no evidence to suggest that the proportion of graphs with slope parameters greater than 45° exceeded that with slope parameters less than 45° . Indeed, all the individual KfVs had mean slopes less than 45° .

Graphical Reporting Practices by Industrial Classification

Given the persistent influence of industry group on reporting practices generally, tests were run (for the first time in the context of financial graphical reporting) on the impact of industrial classification (industrial and service, extractive, financial services, and diversified) on the total number of graphs used. This investigated whether different industrial classifications exhibited distinctive patterns of graph usage. *A priori*, differences could not be predicted. Using ANOVA, a significant difference at the 1 per cent level was found between different industrial classification and the number of graphs used ($p = .001$).¹⁴ As Table 1 showed, diversified companies use the most graphs (mean 25.7), followed by financial services companies (mean 12.3), extractive companies (mean 8.7), and industrial and service companies (mean 7.2). The number of diversified companies is very small (being only three), but their greater graph use reflects their inherent diversity, expressed, for example, by the existence of more segmented graphs. Financial services companies used more graphs than the remaining two sectors, reflecting the large number of graphs concerning asset management and market indices.

We also re-examined H1 and H2 concerning selectivity, using a two-tailed chi-square test, to explore the impact of industrial classification. For the industrial and service sector, the use of *at least one* of the four KfVs was associated with an

¹⁴ We also tested this hypothesis dropping out the diversified category. The result was significant, but only at the .10 level ($p = .089$).

increase in the five-year EPS trend ($p = .006$, $n = 29$); while, for the extractive companies, the five-year trend in EPS was associated with the presence of EPS graphs ($p = .016$, $n = 13$). There were also significant associations between the presence of *at least one* of the four KFVs for the industrial and service sector and, first, the prior-year profit trend ($p = .034$, $n = 41$) and, second, the five-year profit trend ($p = .001$, $n = 28$). The industrial and service sector, therefore, does appear more inclined than the other sectors to selectively use graphs, although this may be attributable partly to the larger sample size.

Analysis of the Design and Construction of Graphs Displaying KFVs

It is desirable that graphs adhere to good design and construction principles. In this section, we identify and discuss, for the first time in an Australian context, some of the main departures from such principles (Table 7 presents the findings in more detail). Our sample contains 149.8 graphs of KFVs (sales, profit, EPS and DPS), comprising 198 variables from sixty-four companies. For illustrative purposes, the KFV graphs that appeared in the annual reports of four companies are reproduced in Appendix B. These examples are selected to represent different features of graphical design, and do not necessarily represent good or bad practice.

Since the time-trend-KFV data comprise two variables, a rectilinear, coordinate graph is appropriate. The bar graph is unsuitable since it has only one variable, and is used for magnitude comparisons of categorical data. By contrast, the column graph has two variables and is more appropriate for time series data (Schmid, 1983, p. 39). Line graphs are unsuited to the display of time series since, by emphasizing the relationship between the two variables, they are more suggestive of a causal link than is warranted (Beattie and Jones, 1992a, p. 25). Simple two-dimensional columns should be used, since the use of three-dimensional specifiers (towers or cylinders) results in perceptual ambiguity (Tufte, 1983, p. 71; Schmid and Schmid, 1979, ch. 10). The most common graph type used for the KFV graphs was indeed the simple column format (forty-two companies). However, nine companies used three-dimensional column graphs, six companies used bar graphs, ten companies used line graphs, and two companies used more unusual formats.¹⁵ The first of these, Orbital Engine Corporation Ltd. (Orbital) (see Illustration 3), used three interlocking rings as a presentational format, an unusual format which violates the conventional rectilinear nature of time series graphs, thus impeding an accurate perception of the graph. The second, Homestake Gold of Australia (see Illustration 1), used a pile of gold coins to represent the underlying financial performance. This type of pictorial graph is a variant of the column graph, since each symbol represents a uniform value (Schmid, 1983, pp. 177–81). Although eye-catching, the 3D nature of the symbols selected introduces ambiguity.

The background to a graph should be non-obtrusive; obtrusive backgrounds may detract from the communicative effectiveness of the graph (Jarett, 1983; Kosslyn,

¹⁵ This classification of graph types totals sixty-nine rather than sixty-four (the latter being the number of companies using *at least one* KFV) because five companies used more than one graph type for their KFVs.

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TABLE 7

SUMMARY OF REPORTING PRACTICES FOR KEY FINANCIAL VARIABLE GRAPHS IN CORPORATE ANNUAL REPORTS

	No. of companies for which issue applies to at least one KFV graph	No. displaying feature	%
Graph type			
Unsuitable graph type (bar, line or pictorial)	64	18	28.1
Structural components			
<i>Background</i>			
Obtrusive background	64	14	21.9
<i>Framework</i>			
No scaled time axis	63	18	28.6
No scaled financial variable axis	63	8	12.7
No proper gridlines	63	27	42.9
No effective scaled financial variable axis, nor gridlines	63	6	9.5
Unconventional ordering of time series (right to left or bottom to top)	64	1	1.6
Non-zero axes	63	3	4.8
Non-arithmetic scale	63	2	3.2
<i>Specifiers</i>			
No space between graphical elements	57	6	10.5
Inconsistent inter-specifier widths	41	3	7.3
Inconsistent specifier widths	41	1	2.4
Three-dimensional specifier	64	10	15.6
<i>Labels</i>			
No effective graph title	63	6	9.5
No proper numeric label on financial variable axis	63	9	14.3
Number attached to every individual specifier	63	19	30.2
Financial variable axis not located conventionally	56	8	14.3
Non-existent or unconventional location of year labels on time axis	63	9	14.3
Unconventional location of number attached to individual specifier	26	12	46.2
Financial variable axis title serves as graph title	58	53	91.4
Remote keys used	64	27	42.2
Presentational enhancement			
Use of slope	63	3	4.8
Top of specifier emphasized	63	23	36.5
Colour of last year's individual specifier a different colour to all other years	64	6	9.4
Colour of last year's individual specifier darker than all other years which were of uniform colour	63	1	1.6
Last year emphasized (other than by colour)	64	2	3.1

1989). In fourteen cases, we judged the background to be obtrusive.¹⁶ We followed the guidelines set by Kosslyn (1989, p. 197) and developed by Beattie and Jones (1992a, p. 26) and reviewed all backgrounds which comprised, *inter alia*, pictures, pictorial adornment, shadows, and black backgrounds. Although inherently subjective, we classed all such backgrounds which we found to be overpowering as obtrusive. For example, Dominion Mining Ltd displayed a mixed line (EPS) and column (net operating profit) graph. The tallest column was 3.6 cm in height; however, a gentleman wearing shorts and a Foster's T-shirt dwarfed this column, being 5.6 cm in height. The message, and the top of the 1990 column, is obscured. Perhaps this is intentional, since while profit increases only marginally from \$A34 to \$A36 million, EPS falls from 10.3 to 9.0 cents (on a weighted average basis).

Sixty-three of the sixty-four companies showing KFVs used rectilinear coordinate graphs. The exception was *Orbital* (see Illustration 3), which presented a very unusual pre-tax profit graph comprising three rings (for 1988/1989, 1989/1990 and 1990/1991). The 1990/1991 ring, with 100 per cent coloration, is superimposed on the two other rings and is thus presented more prominently. For the other two years, only part of the ring is coloured to demonstrate the year's profit. The presentation of the rings leads the viewer to perceive the 1990/1991 year as more impressive than the other two years. This is heightened by the fact that (adapting Tufte's lie factor for a ring) we calculated measurement distortions from 1988/1989 to 1990/1991, and from 1989/1990 to 1990/1991, as +34.3% and +228.8%, respectively. *Orbital's* graph was also unusual in that the conventional order of time display (left to right for columns and top to bottom for bars) was violated. No other company departed from this convention.

Eighteen companies did not use proper scaled time axes, eight did not use scaled financial variable axes, and twenty-seven did not use gridlines. In particular, six companies used neither effective scaled KfV axes nor gridlines, the combined absence of which makes relative judgments extremely difficult. There were three cases of companies using non-zero axes (Brash Holdings, Newcrest Mining and OPSM [see Illustration 2]), and two cases of a non-arithmetic scale (Ampol Exploration and QBE Insurance). The Brash Holdings' profit before tax and EPS graphs were particularly striking, having measurement distortions of +137.2% and +171.4%, respectively. Ampol Exploration's combined sales and profit graph shifts subtly from using a scale interval of twenty to forty. In this case, however, the overall effect is to understate the sales trend with a measurement distortion of -42.5%. The vertical scaling of QBE Insurance's EPS graph shifts from gradations of five cents up to 10 cents. An overall understatement of -29.4% results.

As Table 7 shows, companies frequently departed from the conventional positioning of labelling or used inadequate labelling. In six cases, we found no effective graph title. A common practice was the attachment of numbers to individual specifiers (30 per cent of KfV graphs), which often leads to the abandonment of

¹⁶ Such a judgment was made when the background of the graph drew attention away from the specifier (e.g., distracting logos, unduly bright colours, pictorial distractions or human beings). This was, therefore, a subjective judgment made by the researchers.

explicit scaling. Another common, although not recommended, device was the use of remote keys for labelling (42 per cent of companies used remote keys for at least one KfV graph).

Presentation Enhancement

A range of special devices was identified from the graphs we surveyed that affect perception and may impede effective communication. This is an emerging area of research in graph design, and we do not claim the instances identified to be either definitive or exhaustive.

Where either the specifiers (or the entire graph) slope towards the right, the eye is led upwards and to the right, visually reinforcing the impression of the trend line. We found three instances of this: Brash Holdings, QBE Insurance, and Tubemakers. Brash Holdings and Tubemakers' graphs sloped upwards to the right away from the horizontal axis (see Illustration 4). QBE Insurance's profit and dividends graphs sloped upwards across the page in a series at an angle.

We discovered twenty-three instances in which the top of the specifier appeared to be emphasized, using one of seven devices to draw the eye upwards. First, Ampol Exploration's and Highland Gold's graphs were darker at the top than at the bottom. Second, SA Brewing's and Fletcher's specifiers were pointed and bevelled, respectively. Third, six companies' three-dimensional graphs seemed to give emphasis to the top face. Fourth, in ten companies the use of numbers in the top, or at the top, of the specifier drew the eye upwards. Fifth, as discussed earlier, in the case of Dominion the presence of a man in the background automatically led the eye upwards. Sixth, Goodman Fielder Wattie's arrangement of inter-specifier widths draws the eye to the final year's result. Finally, TNT's operating profit (before interest expense and goodwill amortization) variable was drawn in red and protruded through the profit before interest column.

In seven cases, the colour of the last year was highlighted by being either in a different colour (six cases) or in a darker hue than the previous years (one case). In a further two cases the last year was highlighted in a different way. Goodman Fielder Wattie's last year's labelling was in bold type. Coca-Cola Amatil's 1991 sales and trading profit specifiers use not only bright red (1989 and 1990 were blue), but the labelling was also selective and excessive. For example, *only* the 1991 sales specifier was numerically labelled. This label was 5.2 cm in width by 1 cm in height and, positioned at the top of the specifier (which was only 0.7 cm wide), immediately caught the eye. A duplicate year label (in addition to one at the bottom of the specifier) was also excessively large for 1991.¹⁷

DISCUSSION

Our analysis shows that graphs are used widely in Australian companies' corporate annual reports, suggests that they have distinctive national reporting practices, and

¹⁷ Capital Property Trust provided an interesting example of presentational enhancement, stressing financial highlights (KfVs were not involved). Eleven key highlights were ordered in a rising trend from left to right labelled 'up' and with the appropriate percentage on the top of each column. An overall impression of great success was given by such a judicious arrangement.

reveals that they are subject to impression management. These issues are discussed below, drawing comparisons with the results of previous studies in the U.S., Canada and the U.K., where appropriate.¹⁸ Where possible, we speculate on possible cultural drivers for similarities and differences. Previous financial graph studies have all been based on Anglo-Saxon countries, which previous international accounting research has found to have broadly similar accounting ecologies (see, e.g., Hofstede, 1986; Gray, 1988; Gernon and Wallace, 1995). Nobes (1995) describes the accounting systems of these four countries as micro-based, that is, fair, judgmental and commercially driven. Further down Nobes' classificatory hierarchy, Australia is grouped with the U.K. as being subject mainly to professional regulation, while the U.S. and Canada are subject mainly to governmental enforcement. Parker (1995) focuses on the differences between these major Anglo-Saxon countries, differences which derive principally from the way in which each is regulated. Using the theoretical framework developed by Puxty *et al.* (1987), Parker classes the U.S. as predominantly legalistic, the U.K. as principally associationist, Canada as corporatist and Australia as moving from associationist to corporatist. We speculate that this theoretical framework, combined with the differing stock market pressures in each country, may partially explain the observed differences.

We find, like Mather *et al.* (1996), that Australian companies use graphs extensively. Eighty-nine per cent of Australian companies provided graphs. This is higher than the corresponding proportions in the U.S.A. (79 per cent), in the U.K. (79 per cent), and in Canada (83 per cent). Similarly, the mean number of graphs per graph-using company was highest at 10.5 (U.S.A. and Canada, 10.1; U.K., 7.5). This broad consistency in the use of graphs by Anglo-Saxon countries is likely to reflect the high demand for information disclosure by investors in these micro countries (Perera, 1989, p. 50). Further, if the norm is for large companies to include graphs, then the high incidence of graph usage will be self-perpetuating (see, Neu, 1991). Although the key financial variables (sales, profit, EPS and DPS) graphed by the Australian companies were similar to those graphed in the U.S.A., the U.K. and Canada, differing industrial conditions dictated the choice of other topics. In particular, the high number of graphs of raw material price (forty-one graphs) and raw material products (thirty graphs) reflects the importance of the extractive industry in the Australian environment.

Turning to impression management, we found that Australian companies were selective in their use of graphs (H1 and H2), used graphs that were materially distorted (H3) and used presentational enhancement. We found no evidence to suggest orientation distortion (H5). On selectivity, statistical evidence supported the idea that graphs were included in annual reports when they presented a favourable, rather than an unfavourable, view of corporate performance. In particular, the presence of at least one of the four KFVs was more strongly associated with the five-year profit trend than with the one-year performance trend. This finding reinforces the results of the earlier studies. In both the U.S.A. and the U.K., strong

¹⁸ Insufficient data are given in the Irish study for meaningful comparisons. The prior Australian study does not provide details of mean graph usage.

evidence of selectivity has been found to exist. This result also helps to contextualize the Mather *et al.* (1996) finding of no statistical evidence of selectivity over the current year, since we do find evidence of selectivity over five years. Australian companies, therefore, are selective, but in terms of five years rather than one year. Australian companies, therefore, appear to have a longer time horizon than either U.K. or U.S. companies. This is consistent with the view that the large and more active U.K. and U.S. stockmarkets cause the U.K. and U.S. to be more short-term than Australia.¹⁹ In addition, Epstein and Anderson (1997) suggest that U.S. private shareholders are much more concerned with speculative short-term gains than their Australian counterparts.

Measurement distortion was common in Australian graphs. Thirty-four per cent of all graphs were materially distorted; thirty-one distortions presented a more favourable view than was warranted; while nineteen distortions presented a less favourable view of corporate performance. Statistically, material distortions were found to be more likely to give a more favourable view of the firm than was warranted. Again, this evidence reinforces the prior Australian, U.S. and U.K. findings of interpretative shading in relation to mean measurement distortion.

In general, however, the preparers of Australian corporate reports appear to be relatively less inclined to 'manage' financial graphs: the evidence consistent with selectivity is less strong, and the overall level of mean measurement distortion is lower than in either the U.S.A. or the U.K. A possible explanation for this may be that the Australian capital market is less competitive (both in absolute and in relative terms) than the U.K. and U.S. capital markets. As a result, there may be less incentives for Australian managers to indulge in impression management. In addition, as in the U.S.A., the use of graphs is associated more strongly with performance over five years rather than one year. Indeed, of the three countries Australia is the least short term. Short-termism, rather than regulatory classification, thus appears to be the most reasonable explanation for these differences in impression management.

Finally, Australian graphs were found commonly to exhibit presentational enhancement. In particular, we discovered three cases where slope was used, twenty-three instances where the top of the specifier was emphasized, and nine cases where the last year was highlighted. Although the perceptual impact of presentational enhancement still awaits thorough investigation by statistical graphics researchers, we tentatively suggest that corporate performance is being unduly emphasized. This presentation is, in essence, non-neutral and biased towards the final year's result. The Australian evidence reinforces the U.K. evidence of presentational enhancement. The topic of presentational enhancement was not researched in any of the prior Australian, U.S. or Canadian studies.

Overall, therefore, these international findings of a high degree of selectivity and only moderate levels of distortion and presentational enhancement are consistent with the view that graph use is the *primary* graphical choice, with graph design

¹⁹ The market capitalization of the U.S. and U.K. adjusted by population for 1992 (using Nobes and Parker's, 1995, figures for 1992 as a basis) was about twice that for Australia.

and construction choices being *secondary*. Evidence relating to the use of graphs is generally consistent with the impression management schema in Australia, the U.K. and the U.S.A. Graphs are used to promote the presentation of corporate performance so as to enhance good news, while downplaying bad news.

In interpreting the cause of the observed overall misrepresentation of information in annual reports it is, however, important to recognize that there are two, not necessarily mutually exclusive, potential causes. These are the lack of understanding of graphical principles by designers and the deliberate attempt by designers or management to manage impressions.²⁰ The majority of misrepresentations are favourable to the company, consistent with impression management. However, the very existence of 'unfavourable' misrepresentations suggests that naivety by designers is also a factor.

Graphs are, therefore, part of the process of legitimizing the governance of managers, of convincing users that management is 'doing a good job' in running the company. This legitimization process is not restricted to graphs. Management use a wide array of media and strategies to manage impressions. Graphs are part of the marketing of a company's image through the annual report (Lee, 1994). Impressions of past and future performance can be managed visually, textually or numerically as well as graphically. Visual imaging may comprise photographs or even cartoons (see Graves *et al.*, 1996). Accounting narratives tend to accentuate the positive, but downplay the negative (see, e.g., Ingram and Frazier, 1980). Finally, numerical manipulations have been well documented (see, Schipper, 1989, for a review). In the wider domain, too, annual reports become just one mechanism by which public relations experts exploit the corporate image and brand name. Annual reports, prime-time advertising and corporate promotional videos are all part of a series of techniques by which companies manage the impressions that investors, potential investors and the public have of them.²¹

CONCLUSION

Based on an analysis of the 1991 annual reports of eighty-nine top Australian companies, this paper documents the incidence of graph use and forms of graph distortion. Eighty-nine per cent of companies used graphs, with the mean number of graphs across all companies being 9.4 (10.5 across only graph-using companies). Sales, profit, EPS and DPS were the most commonly graphed financial variables, with 72 per cent of companies graphing at least one such variable. Diversified companies used the highest number of graphs.

Drawing, in part, upon the statistical graphics literature, departures from established principles of graph design and construction were noted. In assessing these departures, it is important to distinguish carefully between the existence of inaccurate and non-optimal graphical practices and evidence consistent with intentional

²⁰ We are grateful to one of the anonymous referees for this point.

²¹ We are grateful to one of the anonymous referees for suggesting this contextualization of our study.

manipulation. In two respects we found inaccurate or non-optimal graphical practices. Not only did 34 per cent of all KfV graphs exhibit material measurement distortion, but 86 per cent of all KfV graphs exhibited slope parameters which departed more than 10° from the 45° optimum, thus reducing communicative effectiveness. In three respects our findings reinforced the view that companies use financial graphs within the corporate annual report as devices for impression management: (a) evidence of selectivity in the use of graphs (i.e., graph use contingent upon favourable performance) was found; (b) KfV graphs were likely to present financial information more, rather than less, favourably than was warranted; and (c) a range of presentational devices (e.g., emphasis on last year) were identified as enhancement devices. These findings regarding impression management reinforce prior studies into the use of financial graphs in Australia, the U.S.A., the U.K. and Canada. They are consistent with the view that financial graphs are one of the devices which legitimize the corporate governance of managers. No persistent, systematic differences were found between industry group and either topics graphed or selectivity.

This paper argues that graphs in annual reports are an important visual device which can be used by preparers to influence users' perceptions. They are widely used, and are also subject to impression management. In particular, they are used selectively to enhance perceptions of managerial performance. These practices undermine the mandatory 'true and fair' requirement of Australian accounts. We believe that the regulatory framework relating to financial graphs in Australia is too lax. Therefore, the auditing statement relating to 'other information' in the annual report (AUP19, 1984) should incorporate explicit reference to financial graphs and established principles of design and construction.

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APPENDIX A

LIST OF COMPANIES ANALYSED

Aberfoyle Ltd	Foster's Brewing Group Ltd
Adelaide Brighton Cement Holdings Ltd	General Property Trust
Advance Bank Australia Ltd	Goodman Fielder Wattie Ltd
Alcan Australia Ltd	Highlands Gold Ltd
Amcor Ltd	Homestake Gold of Australia Ltd
Ampol Exploration Ltd	Hudson Conway Ltd
Argo Investments Ltd	ICI Australia Ltd
Arnotts Ltd	Incitec Ltd
Ashton Mining Ltd	James Hardie Industries Ltd
Australia and New Zealand Banking Group Ltd	Jennings Group Ltd
Australian Foundation Investment Co. Ltd	Jupiters Development Ltd
Australian Gas Light Company (The)	Leighton Holdings Ltd
Australian National Industries Ltd	Lend Lease Corporation Ltd
Aztec Mining Company Ltd	Lion Nathan Ltd
Bank of Queensland Ltd	Mayne Nickless Ltd
Bank of Melbourne Ltd	Metal Manufacturers Ltd
Boral Limited	Metway Bank Ltd
Brambles Industries Ltd	National Australia Bank Ltd
Brash Holdings Ltd	National Mutual Property Trust
Brierley Investments Ltd	Newcrest Mining Ltd
Broken Hill Proprietary Co. Ltd (The)	Nine Network Australia Ltd
BTR Nylex Ltd	Normandy Poseidon Ltd
Burns, Philp & Company Ltd	North Broken Hill Peko Ltd
Burswood Property Trust	North Flinders Mines
Caltex Australia Ltd	OPSM Protector Ltd
Capital Property Trust	Oil Search Ltd
Coal & Allied Industries Ltd	Orbital Engine Corporation Ltd
Coca-Cola Amatil Ltd	Pacific Dunlop Ltd
Coles Myer Ltd	Pasminco Ltd
Comalco Ltd	Placer Pacific Ltd
Commonwealth Bank of Australia	Pioneer International Ltd
CRA Ltd	QBE Insurance Group Ltd
CSR Ltd	QCT Resources Ltd
Dominion Mining Ltd	Renison Goldfield Consolidated Ltd
Email Limited	S. A. Brewing Holdings Ltd
Energy Resources of Australia Ltd	Sagasco Holdings Ltd
F. H. Faulding & Co Ltd	Santos Ltd
Fletcher Challenge Ltd	Schroders International Property Fund Ltd
	Spicers Paper Ltd
	Spotless Services Ltd

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Howard Smith Ltd
Telecom Corporation of
New Zealand Ltd
TNT Ltd
Tubemakers of Australia Ltd
Wesfarmers Ltd

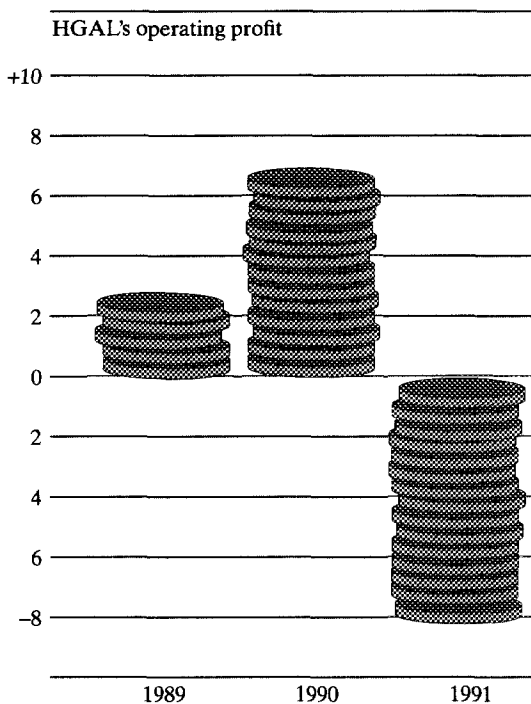
Westfield Holdings Ltd
Westfield Trust
Western Mining Corporation Holdings
Westpac Banking Corporation
W. H. & W. D. Wills Holdings
Woodside Petroleum Ltd

APPENDIX B

ILLUSTRATIVE GRAPHS IN AUSTRALIAN CORPORATE ANNUAL REPORTS

ILLUSTRATION 1

HOMESTAKE GOLD OF AUSTRALIA LTD,
1991 ANNUAL REPORT



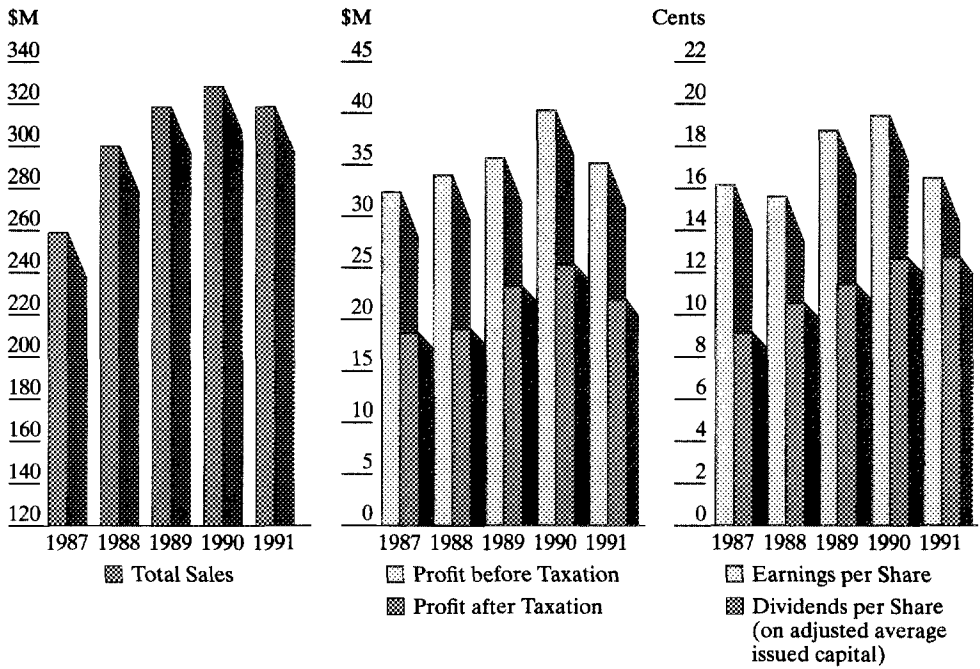
Comments

- The use of gold coins to portray the 1991 specifier obscures the loss as the eye is naturally drawn to the top (zero), rather than the bottom (−8).
- Three-year time series.

ABACUS

ILLUSTRATION 2

OPSM PROTECTOR LTD, 1991 ANNUAL REPORT



Comments

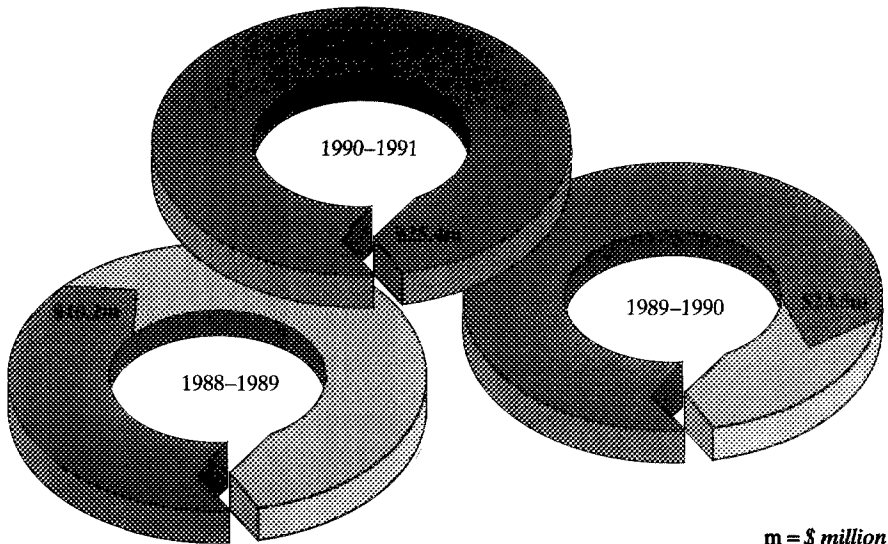
- Includes standard four Australian variables.
- Non-zero axis for total sales causes material measurement distortion.
- 3D specifiers draw the eye to the top.

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ILLUSTRATION 3

ORBITAL ENGINE CORPORATION LTD, 1991 ANNUAL REPORT

THREE YEAR PRE-TAX PROFIT COMPARISON

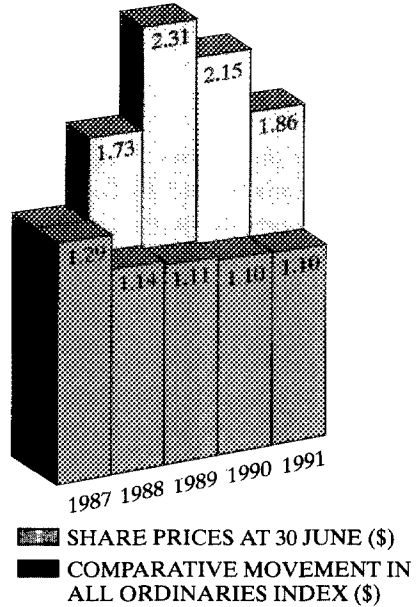
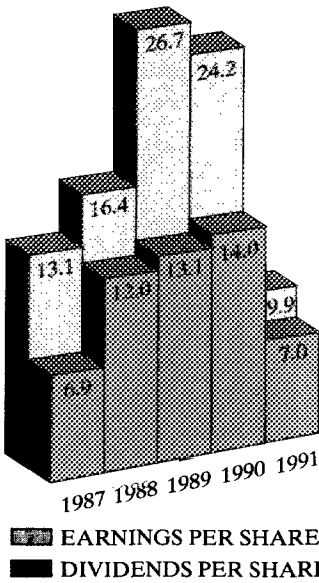
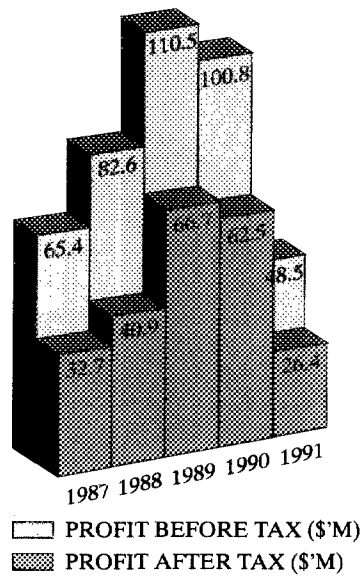
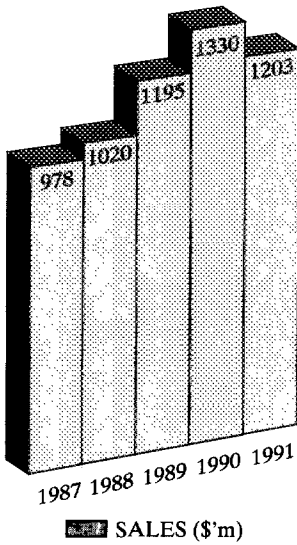


Comments

- Three-year time series.
- Non-rectilinear coordinate.
- Last year most prominent.
- Measurement distortions.

ILLUSTRATION 4

TUBEMAKERS OF AUSTRALIA LTD, 1991 ANNUAL REPORT



Comments

- Graphs slope depthwise to the right, enhancing perceptions of performance in later years.
- Eye drawn to the top of the specifier by numbers and top face of columns.
- Impossible to gauge measurement accuracy of earnings per share and profit before tax graphs, as baseline obscured.